

SOI MESFETs for Extreme Environment Electronics, Phase I

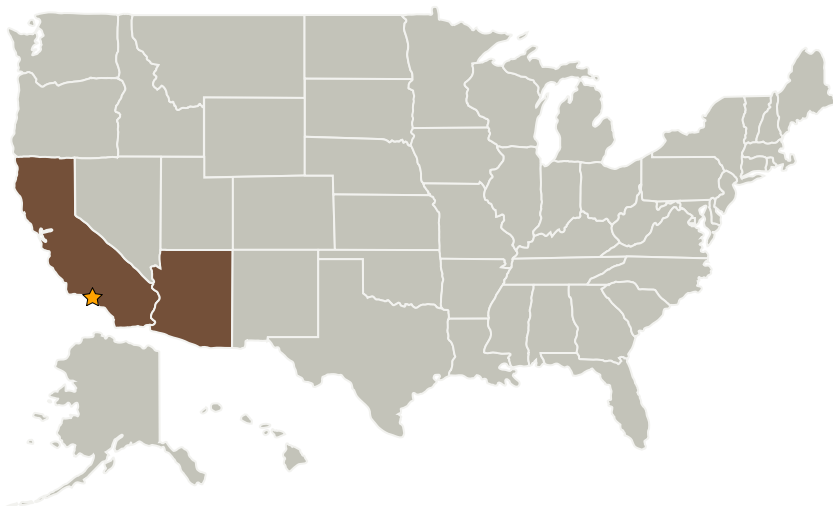
Completed Technology Project (2006 - 2006)



Project Introduction

We are proposing a new extreme environment electronics (EEE) technology based on silicon-on-insulator (SOI) metal-semiconductor field-effect transistors (MESFETs). Our technology allows MESFETs to be fabricated using commercial SOI CMOS foundries with no expensive changes to the process flow. The MESFETs are radiation tolerant and the use of SOI substrates makes them SEU immune. They offer unique advantages compared to equivalent geometry MOSFETs including: i) higher operating frequencies in the ultra-low power regime; (ii) 10 ? 100X lower 1/f noise; (iii) high voltage operation (>20V). The MESFETs show excellent performance up to 200C, as do simulations down to ? 185C. The low-noise, high-speed (GHz) and ultra-low power capability of the SOI MESFETs makes them ideally suited for a variety of EEE mixed-signal circuits including analog-to-digital converters, low-noise amplifiers and voltage/current references for advanced sensor applications. The high voltage capability also suggests MESFET applications in power amplifier communication modules, as well as DC-DC converters in power management systems. During Phase 1 we shall develop device models that describe MESFET operation over the temperature range ?180 to + 130C. The models will be calibrated against data taken from our existing MESFETs, and will operate within industry standard CAD tools. The models will be used to design and simulate an operational amplifier, a voltage controlled oscillator, a power amplifier and a low noise amplifier. The layout of the simulated designs will be completed during Phase 1, for fabrication during Phase 2 in partnership with a commercial foundry.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Areas	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
SJT Micropower	Supporting Organization	Industry	Fountain Hills, Arizona

Primary U.S. Work Locations

Arizona	California
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.2 Electronics